...information for the Defense modeling and simulation community...

DMSO NEWS

Volume 5 Number 3 Fall 2000

INSIDE ...

Visit DMSO's newly renovated Web page -- it's Section 508 compliant -- and check out the "M&S News Briefs" for community news.

Nomination period opens for '00 DoD M&S Awards

By Sherrel Mock
DMSO Public Affairs

The nomination period for the 2000 Department of Defense (DoD) Modeling and Simulation (M&S) Awards will open on Oct. 1 and close on Dec. 8. Awards will be presented May 30 during the DMSO Industry Days.

Detailed nomination procedures and forms will be posted on the DMSO Web site at *http://www.dmso.mil/awards/* prior to Oct. 1.

Awards will be presented in four categories for accomplishments during Fiscal Year 2000 – Oct. 1, 1999 through Sept. 30. A winner – individual, team or organization – will be selected in each category. The first three categories consist of the M&S functional areas – training, analysis and acquisition. The fourth category, a cross-functional area, considers those broader endeavors that impact two or more of the functional areas.

All units, organizational elements and individuals – both civilian employees and active duty service members – of the DoD Components that are involved with the development and/or use of M&S are eligible.

The awards program, now in its third year, was initiated by the DMSO in 1998:

- to enhance M&S awareness throughout the DoD
- and to recognize excellence, innovation and achievement in advancing the "state of the art" of M&S and/or in contributing to interoperability and reuse in support of DoD M&S objectives.

This includes, but is not limited to, the development of standards and architectures; techniques and tools; synthetic environments; and new military applications.

For more information

For more information visit the DMSO World Wide Web site at *http://www.dmso.mil/awards/* or contact:

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HLA clears final hurdle on track to IEEE standardization

By Sherrel Mock
DMSO Public Affairs

The DoD High Level Architecture (HLA) for simulation cleared the final hurdle to becoming an IEEE standard on Sept. 21. The Standards Board of the Institute of Electronic and Electrical Engineers (IEEE) voted to accept the HLA as an international standard.

The Standards Board "formality" vote followed a unanimous approval by the subordinate Review Committee (RevCom) on Sept. 20 at IEEE headquarters in New Jersey.

Phil Zimmerman, HLA program manager for the Defense Modeling and Simulation Office (DMSO), has been following the progress of the IEEE review closely. She and several members of the team that worked to bring about the IEEE standardization attended the RevCom meeting. "We attended (the meeting) to ensure that we would be available to immediately answer any issues or questions that might come up," she said.

"We were given an additional piece of good news at the RevCom meeting," Zimmerman said. "We were able to meet with the IEEE editor in charge of our specifications. She indicated that it's likely the specifications will be ready for publication by the end of this calendar year – much sooner than we had anticipated. This is largely due to our up-front efforts in formatting

See IEEE, p. 12

Photo by Steve Wilson, DMSO

Director's Corner

By Colonel Wm. Forrest Crain, U.S. Army

"From New Vector to Direction & Magnitude - WE are Implementing"

In March the DMSO embarked on an ambitious mission to find a better way to support the Warfighter. Ever since then we've been telling folks about our "new vector" and about how we planned to get there from where we were. Well, it's been six months and the "New Vector" has evolved to "Direction & Magnitude" – and WE, the M&S Community, are implementing it.

We've been on the road talking to the warfighters over the past few months and I think it's having a positive effect – they 're telling us what they need, what we're doing that's helping and what we're doing that's not much value added. One of the good things we're hearing from the warfighters, our service counterparts and other DoD leaders and staffs is that they feel we're on the right track. That's the kind of feedback we need if we expect to live up to our vision of leading, integrating and leveraging M&S for the warfighter.

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We used that feedback to build our plans and budget for the next fiscal year. The Executive Council for M&S (EXCIMS) approved our plans at its August meeting. I'd like to share them with you here.

• ***Begin High Level Architecture (HLA) technology transition***. We'll begin the transition of the HLA to a sustainment phase in '01. Reducing the costs of supporting the HLA program allows the DMSO to redirect dollars to other activities that benefit the M&S community. We'll continue to do bug fixes (and performance enhancement as required) type of support, but we won't be developing any new tools. Having said that, we still have some work to do once the three HLA specifications are accepted as IEEE standards to ensure the DoD M&S community's needs are met. See Phil Zimmerman's article in this newsletter for details on this effort.

• ***Improve M&S service to the Warfighter in concert with defined needs***. We've gone to every warfighting commander-in-chief (CINC) and asked for their M&S needs and priorities. Those assessments are being incorporated into a web-based, interactive database of user-prioritized M&S requirements with key-

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Director's Corner

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word search capability – sort of a "Yahoo" search engine for M&S. If, for instance, someone in the Pacific Command wants to know what's going on with verification, validation and accreditation (VV&A), the search will turn up where other folks across the M&S community are focusing their VV&A efforts. Unlike the M&S Resource Repository, which is more content or product oriented, the warfighter requirements database will be requirements based. We expect to test an initial prototype at DMSO in October and open it up for review by .mil users later. At some point we'll open it up for use by the entire M&S community. We'll update the data through regular follow-up visits to the CINC-doms and provide the means for them to update their data online. We think this is going to be a very useful tool. Having the CINCs prioritized requirements will be a big help as we revise the DoD M&S Master Plan (MSMP).

• ***Expand the Science and Technology (S&T) Initiatives Program***. I don't want to steal any thunder from Jim Anthony's article elsewhere in this newsletter, but the S&T Initiatives program has moved out smartly since we stood it up in April. In a fairly short period of time 13 S&T projects were selected and funded by the DMSO and the service and joint M&S offices for Fiscal Year 00. The prospects for FY01 look even better. We've received submissions from over 50 academic, industry and government organizations in response to our request for information (RFI) on advanced M&S technologies for supporting analysis, acquisition and training simulation applications. We're using that information to lay out the FY01 M&S S&T Initiatives Program. We expect to issue a request for proposals for the program in late September or early October.

• ***Address challenges and coordinate Integration Task Force results***. We're closing in on completing our information collection effort for this task and should have a plan for the EXCIMS to approve at its next meeting this fall. Because part of figuring out what needs to be done is knowing what we have and haven't accomplished, we're also assessing how successful we've been at meeting the objectives prescribed in the current (1995) DoD MSMP. This work will provide the foundation for revision of the MSMP, which we expect to start next year.

• ***Continue investments based upon Warfighter needs, Integration Task Force, and S&T Initiatives***. One of the things we're hearing across the board as we visit the CINCs is the void in simulation support for Operations Other Than War (OOTW). We're already looking at how we can jump start activities to support this requirement in '01. We're also looking at federating the Joint Simulation System (JSIMS) and the Joint Warfare System (JWARS) to enable CINCs to use JWARS as a course of analysis tool using real-world data piped through JSIMS C4I interfaces. The S&T Division will be looking at next-generation simulations that are agent based vice algorithmic. Agent-based simulations use environment to constrain behavior where algorithms do that job in our current simulations.

• ***Continue and upgrade M&S education and mature Service Academy education partnerships***. Recognizing the need to start laying a foundation of M&S knowledge and skills in the officer corps at the earliest opportunity, we began working with the services and their respective academies to promote M&S education efforts in each school. In '01 we'll implement an M&S Intern Program for cadets, deliver a number of DMSO-sponsored M&S courses at all three academies, and take a look at how we can sponsor visiting M&S professors at each academy and expand the overall effort to the services' ROTC programs in FY02.

Again, we think we have a good program and I'd like to thank all those who took the time to give us their thoughts and assistance over the past few months. Because the DoD's return on investment in our plans will be measured in how well we implement them, please let us know how we're doing. Feedback is the surest way we have for staying on course.

Before I close I'd like to introduce two new arrivals to the DMSO staff.

LtCol Chris "Thumper" Hadinger is now our resident Marine. He arrived in June to replace LtCol Mark "Mac" McKeon as chief of the Warfighter Requirements Division. When I talked earlier about DMSO getting out to talk to the CINCs and their staffs I was referring to Thumper. He hit the ground running and has been on the road talking to the warfighters ever since. He's an aviator with over 2,000 hours in a variety of aircraft and numerous assignments aboard ship and overseas.

Lt Col Eileen Bjorkman is chief of the Concepts Application Division. She's a Air Force senior flight test engineer with over 700 hours in 25 different military aircraft. She joined DMSO following graduation from the Industrial College of the Armed Forces in June. In addition to overseeing community support efforts like the MSIAC, MSRR and M&S Education, she serves as the DMSO liaison for Simulation Based Acquisition and logistics.

Finally, our bottom line is to lead, integrate and leverage M&S for the warfighter. We take it seriously. If we're doing it right let us know. If we're doing it wrong let us know. If you have an idea that will help us serve the warfighter better let us know. The staff's e-mail addresses are available on the DMSO Web site at *www.dmso.mil*. If you don't know who to contact send a note to *ASK@dmso.mil*. We'll sort it out and get back to you. Our phone number is (703) 998-0660. Give us your feedback.

Respectfully,
Forrest

Lead, integrate & leverage M&S for the Warfighter

Upgraded Harrier simulator takes off

By Naval Air Systems Command Pubic Affairs

PATUXENT RIVER, Md. (Navy News Service, Sept. 7, 2000) — Marine Corps Harrier pilots at Marine Corps Air Station, Yuma, Ariz., have a new simulator to train them on the Radar Night Attack version of the AV-8B Harrier.

The simulator has a cockpit that provides the pilots with a realistic presentation of how to use the hands-on throttle and stick switches and the APG-65 radar in the air-to-ground role. It will also be used to train them in vertical short takeoffs and landings; day/night and radar training in normal and emergency operations; navigation; shipboard taxi, takeoff and landing procedures; and air-to-air and air-to-ground weapons delivery.

"While conducting anti-air warfare missions, intercept missions and other air-to-air missions, this simulator has provided the most realistic visual and radar training ever," said Marine Corps Capt. Thomas J. Harmon, radar standardization officer, Marine Attack Group (MAG) 13. "With the simulator's instructor having full control of the target, coupled with the high resolution visual system, air-to-air scenarios can be simulated with the utmost realism, whether the target is 60 miles out or up close."

Harmon said that Indra Sistemas, Silicon Graphics, and Aechelon Technologies have created an electronic masterpiece that has been marveled at by several different countries, services and industry specialists.

"The visual system has the highest resolution in the world," Harmon said. "It is truly the best simulator in the world, and MAG 13 is thrilled to have it."

The new visual system uses a Silicon Graphics computer and provides photo-texture imagery using a flat panel projection system. It also projects information to the cockpit's heads-up display and can be used with a simulated night vision goggle system.

The AV-8B Harrier II Plus is a second generation vertical/short takeoff and landing light-attack jet aircraft used by the Marine Corps primarily to provide close air support for ground forces. This single-seat, advanced fighter can operate from short fields, forward sites, roads and surface ships.

More information about the AV-8B Harrier can be found on the official web site of the U.S. Marine Corps at *http://www.usmc.mil/*, under "general information."

Who is Mike Simmen?

Who is Mike Simmen? He's logical and emotional, but is he guilty?

The FBI needed a computer program that could realistically simulate a human personality to help agents develop their interviewing and interrogating skills. What they got was "Mike Simmen," an interactive, self-paced, user friendly simulated man with multiple dispositions who won't let agents "beat the system."

Sometimes he's talkative and eager to help, other times he's busy and defensive. Sometimes he's guilty, sometimes he isn't.

Read about the simulated man in the April issue of the "FBI Law Enforcement Bulletin." View or download the bulletin in *.pdf* format at *http://www.fbi.gov/library/leb/2000/apr00leb.pdf*. The article is on pages 16-20.

Army Space Command runs missile defense exercise

By Tom Mahr
JNTF Public Affairs

SCHRIEVER AFB, Colo. (Army News Service, Aug. 24, 2000) — U.S. Army Space Command organized a joint Battle Planning Exercise Aug. 16 for the nation's missile defense system.

The exercise was the eighth in a series of exercises sponsored by the U.S. Space Command to fine-tune its battle management command, control and communications system. It was held at the Ballistic Missile Defense Organization's Joint National Test Facility at Schriever Air Force Base, Colo.

The Joint National Test Facility is the BMDO's premier modeling, simulation and test center, officials said. The JNTF is focused on interservice, interoperability and integration aspects of the nation's national and theater missile defense programs.

"Today's exercise had two purposes," explained Army Maj. Tom Anderson, of U.S. Army Space Command's plans division. "Our first goal was to examine the importance and impact of the rules of engagement," Anderson said, to defend North America against ballistic missile threats. "Our second goal was to give those of us in the operational community a chance to practice making critical operational decisions using the current version of the NMD (National Missile Defense) battle management software."

The exercise brought NMD operators from USSPACECOM, the North American Aerospace Defense Command or NORAD, Air Force Space Command, USARSPACE and the Army National Guard with a number of DoD and contractor members of the "developer" team for discussions and exercises using the prototype NMD battle management command and control software.

"The BPExs are conducted here in the JNTF to enable us to take advantage of the BMC3 Element Laboratory's operational software and analytical tools," explained Army Maj. Stuart Strong, Program Manager for the BMC3 Element Support Center and Laboratory.

Lt. Col. Stephen Sovaiko, assigned to NORAD/USSPACECOM's Cheyenne Mountain Operation Center, summed up his experience: "This exercise was important because it focused our attention on ways the national command authorities might use a national missile defense system to counteract a wide range of possible threats to North America, both intentional and accidental. The exercise also revealed a lot of policy work which remains to be done on engagement doctrine."

Canadian Forces Maj. Gen. David Bartram, NORAD's director of operations and the exercise CINC, agreed with and underscored Sovaiko's observations. "Recommendations will flow from the exercise to the NORAD and USSPACECOM staffs which will ultimately be reflected in BMD concepts of operations and/or requests for changes or clarifications to the ROE for ballistic missile defense."

Air Force JEFX '00

Experiment "provides both near-, long-term benefits"

HURLBURT FIELD, Fla. (Air Force News Service, Sept. 8, 2000) — The Air Force conducted Joint Expeditionary Forces Experiment 2000 Sept. 5-15 at various U.S. locations.

JEFX '00 is the third annual large-scale Air Force experiment combining actual aircraft sorties, or "live-fly forces," models, simulations, and technology insertion to explore and evaluate new processes. It also serves as the Air Force's contribution to Millennium Challenge '00 — the Joint Force Command's first major-leveraged joint experiment.

While that may seem like a mouthful, Col. Kevin Dunleavy, JEFX '00 director, summed it up more succinctly.

"Air Force experimentation provides both near- and long-term benefits for our warfighters," said Dunleavy. "It provides a means to assess new technologies and operational concepts, allows warfighter involvement early in the acquisition process and produces better informed investment decisions."

The primary objective of JEFX '00 was to assess Air Force operations using new technology and capabilities in a simulated warfighting environment. That means meeting the evolving needs of the Expeditionary Aerospace Force of the 21st century.

The main focus of this year's experiment was to look at innovative means of providing agile combat support to aerospace expeditionary forces. As such, the JEFX explored future capabilities to enable the commander of Air Force forces and his staff to sustain and protect AEFs in a coalition environment.

Other areas looked at during JEFX '00 were time-critical targeting, air mobility, joint battlespace infosphere, and intelligence, surveillance and reconnaissance battle management.

Planners for the experiment stressed the difference between an experiment and an exercise, noting that the main point is to learn, not to train. They emphasize that JEFX is a discovery process that integrates new and emerging technologies, solves deficiencies and provides advanced capabilities. It is not an exercise, test or technology demonstration.

The wide scope of the experiment called for a large supporting cast, as more than 3,000 military participants at 12 sites across the nation helped to discover better ways to accomplish Air Force missions in a joint/combined environment.

The three main operating locations for JEFX '00 were Langley Air Force Base, Va., Hurlburt Field, Fla., and Nellis AFB. Nev. The majority of the 250-plus aircraft sorties were flown over the Nellis ranges.

In addition to a wide variety of Air Force aircraft taking part, other services provided some aircraft including the U.S. Army's AH-64, the U.S. Marine Corps' F-18, and the U.S. Navy's A-3.

M&S Training

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HLA Hands On Practicum

The four-day practicum provides a practical programming experience with the concepts of HLA and the Runtime Infrastructure (RTI). All courses are presented in Alexandria, Va.

- Oct. 16-19
- Nov. 6-9
- Nov. 27-30
- Dec. 11-14

For more information about the HLA Hands On Practicum and to register online visit *http://www.virtualtechcorp.com/hop/*

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Have a question about the DMSO, its programs or DoD M&S policy, but don't know who to call? Send your query to ***ASK_DMSO@dmso.mil***. We'll sort it out, send your question to the right people and get you an answer.

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Enterprise

"Paint the Night"

HLA takes a round trip from Belvoir to Knox in BCR experiment

By Max Lorenzo
CECOM Night Vision and Electronic Sensors Directorate

The Army's Communcation-Electronics Command (CECOM) Night Vision and Electronic Sensors Directorate (NVESD) made distributed simulation history April 10-19 by integrating a high-resolution, engineering-level sensor simulation into the Mounted Maneuver Battle Lab's (MMBL) fourth Battle Command Reengineering experiment (BCR IV) at Fort Knox, Ky., from a remote site at the NVESD at Fort Belvoir, Va.

The NVESD implemented this remote simulation across an asynchronous transfer mode (ATM) backplane using a DoD High Level Architecture (HLA) federation. Federate components of the sensor simulation, consisting of the controls and display were located at Fort Knox and communicated sensor status and viewing direction over Defense Research and Engineering Network (DREN) OC-3 lines to synthetic image generator and sensor effects federates at Fort Belvoir. The Fort Belvoir federates then transmitted high-resolution synthetic sensor imagery back to Fort Knox in real time. Modular Semi-automated Forces (ModSAF) were used to populate the battlefield with both friendly and enemy forces driven from Blue and Red cell workstations located at the Fort Knox MMBL.

BCR encompasses the challenges the Army faces in incorporating rapidly changing electronic communications, computer and sensor technology into the 21st century force structure. The purposes of BCR IV were as follows:

- To examine the effects of digitized command and control at brigade and lower levels. These effects included the impact of improved Battlefield Visualization on Battle Command, and implications of near-perfect situational awareness.
- Develop more effective tactical operations centers.

Among the futuristic capabilities represented in this far-reaching experiment are a common-database command and control system, video-teleconference white board, robotic unmanned air and ground platforms with advanced sensor packages, and uplinks to synthetic aperture radar and satellite imagery. Past experiments have shown that while these advances provide more and better information to commanders, staffs and soldiers, they can also overload them with information, increasing their workload and requiring them to filter a glut of information to make sound and timely decisions on the battlefield. BCR IV provided a comprehensive environment in which to assess these issues.

BCR IV included six reconfigurable man-in-the-loop simulators representing a future scout platoon armed with futuristic sensors, robotic platforms and communications equipment. The "Paint the Night" sensor simulation was configured to operate with the platoon leader's or platoon sergeant's simulator – a physically reconfigurable future scout vehicle simulator with two seats (commander and mission specialist stations), a control stick, three monitors and a sound system, supported by an SGI Onyx 2 (for "out-the-window" visuals), and several SGI O2s providing 2D display, controls and simulation host functions. A driver's station was located adjacent to the commander/mission specialist compartment. One monitor (with touch screen/controls) was used for fire control. A second monitor (also with touch screen/controls) was used for the sensor view. A third monitor was used for a plan view display of ModSAF.

This simulator was connected to the Fort Knox exercise network via the Distributed Interactive Simulation (DIS) standard, and to the Paint the Night HLA federation through the ATM network, using a DIS-to-HLA converter that was positioned at Fort Knox. The ModSAF version used during BCR IV communicated with the simulation network via DIS protocols and updated the BCR commander and tactical operations center situational awareness displays based on ModSAF intervisibility and constructive sensor algorithms.

The NVESD sensor simulation provided a valuable and realistic component to the BCR IV exercise. While much of BCR IV simulated sensor effects either constructively, or through low fidelity "stealth" displays, the NVESD sensor simulation gave the battalion task force a taste of the information that can actually be accessed through a realistic, advanced sensor. The NVESD provided the scout platoon leader the ability to "attach" the sensor to unmanned aerial and ground vehicles, as well as sensor packages mounted on manned systems. One of the advanced electro-optical sensors planned for use on these systems is the Long Range Advanced Scout Surveillance System (LRAS3). In the LRAS3 configuration, the Paint the Night sensor simulation represents the following:

- 2nd Generation. B-Kit LongWave Scanning FLIR
- Day TV (Charged Coupled Device)
- Laser Range Finder (Far Target Locator)
- Global Positioning System
- Common Aperture Optics (Narrow and Medium Fields of View)
    - FLIR
    - TV

The Synthetic Environment for BCR IV represented an area around Tuzla, Bosnia. The exercise play box was approximately 180 kilometers by 130 kilometers consisting of mountains and forests with narrow maneuver corridors in the river valleys. National Imagery Mapping Agency (NIMA) elevation and feature data were available to support infrared (IR) sensor database builds. Paint the Night used a 30-meter Digital Terrain Elevation Data (DTED) Level II model to create a triangular mesh representing the terrain surface with digitized roads and forested areas in the form of polygonal models that were planted on the terrain, according to 2D point and linear overlays extracted from ARC Digitized Raster Graphics (ADRG), 1:50,000 scale image maps of the exercise area. This process resulted in an

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Paint the Night

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exceptionally dense, high performance 3D scenes in Paint The Night. For example, the Paint the Night visual database included about 15 million trees.

Paint the Night can support higher resolution feature content than many legacy simulators, including the standard daytime visual systems used in the reconfigurable scout simulators. However, to support the BCR IV simulation environment, it was necessary to interoperate with these lower resolution displays, including "Out-the-Window" (e.g., Stealth and fire control optics) displays, and with ModSAF. Paint the Night engineers conducted correlation studies by extracting terrain information from ModSAF, and compared ModSAF terrain, which had 100% correlation to the daytime visuals, to the denser topographic data content used in the Paint the Night visuals. Correlation of ground elevations, road junctions and forested areas was examined. in relation to authoritative NIMA source products. While it proved necessary for Paint the Night to employ ground clamping to accommodate differences between the ModSAF terrain and Paint the Night terrain, a high degree of visual fidelity and functional interoperability among simulations was otherwise achieved, and "fair fight" issues did not arise due to lack of full terrain correlation between Paint the Night, other 3D visual systems and ModSAF. This resulted in part from the fact that the Paint the Night sensor simulation role was limited to reconnaissance and surveillance tasks. However, Paint the Night does possess software utilities to create end-to-end ModSAF terrain that is fully correlated with the sensor scene generator, when that is required.

In preparation for BCR IV, the Paint the Night Team at the NVESD developed 50 target models to support the exercise requirements, about 30 of which came from the Army Research Laboratory's (ARL). These included standard U.S. and former Soviet ground combat vehicle and aircraft types currently in use. Several futuristic ground and air vehicles and robots, including unmanned ground vehicles (UGV) and unmanned aerial vehicles (UAV) were provided by the MMBL. These 3D models derived from ARL target models, with highly detailed geometry had signatures from real vehicles applied to depict the target's signature from the sensor standpoint. These targets had up to four levels of detail, allowing the relatively narrow sensor fields of view to display targets up to 10,000 polygons on a single vehicle.

Over the past twelve months the NVESD has collaborated with the ARL in creating a high-fidelity engineering simulation that represents sensors and realistic target effects in a common, HLA-based simulation environment. This federation is called the "Paint the Night and Synthetic Wide-band Imaging Spectra-photometer and Environmental Simulation (SWISS) Together", or PST Federation. As developed for BCR IV, the PST Federation consisted of the following components:

• The ***Device Federate*** monitors man-in-the-loop interface hardware through a low-level device driver and publishes the device's mode using query/response interactions as an array of generic analog and digital signals. This federate may be configured to work with any device and control all aspects of the federation object model (FOM).

• The ***Sensor Controller Federate*** reads the output of the device federate for device mode, sensor position, orientation and configuration. This federate publishes the sensor location, mount point (e.g., position of the sensor relative to the vehicle of which it is a component), and configuration to a sensor image generator federate.

• The ***Sensor Image Generator (SIG) Federate*** subscribes to the sensor controller for "attached" vehicle data (location, type, identification) and camera position and attributes (field of view [FOV], view port size), and to the SAF Interface and other federates which generate remote entity and platform data. The final rendered frames are published by the SIG Federate and piped to the Datacube via a digital video port, using a database pager to manage the scene graph.

• The ***Sensor Effects (Datacube) Federate*** subscribes to sensor parameters (FOV, magnification, electronic zoom, gain, level and polarity) for proper sensor effects generation, and to sensor symbology and reticle data for overlays. The Datacube transfers video via the ATM (X/Open Transport Interface) to remote display (e.g., the sensor display in the future scout simulator).

• The ***SAF Interface Federate*** subscribes to vehicle objects from SAF and converts SAF entities from external FOM (including DIS exercises) into the PST FOM. This federate publishes entity/platform data to sensor controller and SIG federates. The current implementation consists of a DIS/HLA gateway, which converts and publishes DIS Protocol Data Units (PDUs) as HLA objects and attributes. In the future, this federate will also convert Paint the Night entities to external FOM; efforts are ongoing at the NVESD to improve the reliability of the DIS-to-HLA conversion.

• The ***SAF Federate*** was not used during BCR IV, whose ModSAF applications used DIS to publish entity state information. However, the PST Federation supports Joint Semi-automated Forces (SAF) applications using RPR FOM. In the future, Agile FOM interface will also be employed.

• The ***Far Target Locator Federate*** subscribes to vehicle/sensor location and orientation, and will subscribe to Global Positioning System (GPS) data from a solar system federate, when available. It uses intersection to determine range and calculates target position in a military grid.

The NVESD has been connected on the DREN to the ARL at Aberdeen Proving Ground, Md., for almost a year at OC-3 bandwidth (155 mbits/sec). The NVESD invested in upgrading Fort Knox to an OC-3 connection on the DREN in support of these efforts. This has enabled a 35-frames-per-second (fps) scene refresh capability from Fort Belvoir to Fort Knox over OC-3 several times over the past year. During BCR IV, this rate was lessened to an average bandwidth consumption of about 60mbits/sec or 21 fps for 640 by 480 images. Factors influencing this included transport delay through the Datacube federate and internal routing of traffic on the Fort Belvoir leg of the network. The Scene performance varied between 15-60 Hz, depending on the number of total entities in the exercise, and the number of entities filtered out through the DIS/HLA gateway. BCR IV supported about 2400 entities, roughly half of which were filtered out, based on spatial filtering to keep the frame rate up. Paint the Night handled over 1200 simulated vehicles using Runtime Infrastructure (RTI) 1.3v7. It was discovered that the network was better able to handle this level of traffic if vehicles were added slowly, in increments, since adding them all at once overwhelmed the Cisco router central processing unit (CPU), resulting in significant packet loss.

Network Latency between Fort Belvoir and Fort Knox latency varied from 11-13 milliseconds (ms) for each leg, giving less than one frame of video delay (33ms/frame). The goal for total end-to-end latency was less than 250ms. An estimated latency of less than 200ms was achieved, broken down as follows:

- 16ms — Grip digitization
- 11ms — DREN path Fort Knox to Fort Belvoir
- 66ms — SIG
- 33ms — Sensor Effects (DataCube)
- 11ms — DREN path Fort Belvoir to Fort Knox
- 33ms — Video display

The BCR IV experience points the way to the future use of engineering level experiments in conjunction with high-performance computing resources on behalf of DoD battle labs. Army Materiel Command (AMC) labs are already planning a Pan Research, Development and Engineering Center (RDEC) capability that will allow for digital representation of sensors as well as other battlefield and platform specific systems *before*

See PAINT THE NIGHT, p. 9

Prairie Warrior '00

Use of HLA RTI marks first time RTI has replaced ALSP in JTC exercise

By Jayne Talbot, MITRE
JTC Project Lead

In May, the DoD High Level Architecture (HLA) successfully supported the Army's *Prairie Warrior 2000 (PW00)* exercise.

PW00 is an annual Corps-level exercise conducted by the Command and General Staff College (CGSC) at Fort Leavenworth, Kan., that provides a training and experimental venue for CGSC students and the senior Army leadership to evaluate future doctrinal and force structure development.

The use of the HLA Runtime Infrastructure (RTI) in PW00 marks the first time the RTI has replaced the existing Aggregate Level Simulation Protocol (ALSP) in a Joint Training Confederation (JTC) exercise. It also marks a major milestone to integrate the RTI with JTC simulations via an "ADAPTOR" (ALSP Data and Protocol Transfer Over RTI) along with newly developed HLA exercise management and data collection tools.

This transition from ALSP to HLA offers the potential to use a wide range of off-the-shelf, widely supported HLA tools with the JTC and move away from proprietary ALSP-based software products. By moving to the use of more widely used software simulation products, it is hoped that maintenance of the JTC over the next several years will be made easier, until such time as it is completely replaced by the Joint Simulation System (JSIMS).

For PW00, six simulations in the JTC were used to simulate the battlefield scenario. They included the Army's Corps Battlefield Simulation (CBS), Combat Service Support Training Simulation System (CSSTSS), and Tactical Simulation (TACSIM); the Air Force's Air Warfare Simulation (AWSIM); the Joint National Test Facility's Missile Defense Space Tool (MDST); and the Joint Warfighting Center's JQUAD model – a combination of Joint Electronic Combat Electric Warfare Simulation, Joint Command and Control Attack System, Joint Network Simulation, and Joint Operations Intelligence Simulation. The air operation simulations, AWSIM and JQUAD, were run remotely from Hurlburt Field, Fla., and communicated with the remaining simulations over a dedicated T-1 line. The other simulations, the training audience and operations were distributed among several buildings at Fort Leavenworth.

The exercise configuration also demonstrated the utility of using the ADAPTOR as an intermediate component to link ALSP-based simulation components with other HLA-based simulations and tools. The ADAPTOR allows simulations that wish to retain their ALSP-based interface to communicate via the RTI with simulations that have migrated to HLA-based interfaces. Over the past year, the CSSTSS has developed an HLA-based interface that allows users to bypass the ADAPTOR and communicate directly via HLA. In addition, two other HLA tools – the Federation Management Tool (FMT) and the Data Collection Tool (DCT) – were used to provide exercise management and data analysis services throughout the exercise. These tools employ direct HLA interfaces (no ADAPTOR) but can now be used to support JTC exercises. The version of the RTI that was used was RTI 1.3 version 7 – a version that the JTC had worked with closely over the past six months during integration events and confederation tests.

The exercise was conducted 9-10 hours per day over a five-day period for a total of 48 exercise hours. As with many computer-assisted exercises (CAXs), problems did occur that led to some down time during the execution. The JTC was down for approximately six hours, which resulted in 89% availability to the exercise. This down time was attributed to model problems as well as the simulation infrastructure itself. Because of the simulations' link to the C4I systems, when the models or infrastructure crash, there is a ripple effect through the system. Recovery from down time can take longer than the crash itself because the C4I systems must be purged of data and reset. This process can be lengthy, as it was during PW00.

Following PW00, the JTC has begun transitioning to RTI 1.3 Next Generation (NG). Problems uncovered during the exercise will be addressed with the move to the latest version of the RTI. Plans for use of RTI NG during the 2001 testing cycle are underway.

For more information

For more information on Prairie Warrior 2000, go to *http://www-cgsc.army.mil/pw/index.htm*

For more information about the JTC, go to *http://ms.ie.org/alsp/*

DMSO, AFRL collaborating to support R&D testbed for cognitive modeling

By Laura Feinerman
Federation Manager
And
Ruth Willis, PhD
DMSO Staff

The Defense Modeling and Simulation Office (DMSO) and the Air Force Research Laboratory's (AFRL) Human Effectiveness Directorate are collaborating on a DoD High Level Architecture (HLA)-based testbed to support research and development of advanced models of individuals and teams.

The testbed will provide model developers a capability to investigate the applicability of the Federation Development and Execution Process (FEDEP) to the development of cognitive models, to test the HLA Runtime Infrastructure's (RTI) ability to support cognitive modeling, and to investigate reuse and composability issues for computer generated force (CGF) models.

The testbed project kicked off July 20. For the first year, the DMSO has teamed with the AFRL to rehost the air traffic control environment used in AFRL's Agent-Based Modeling and Behavioral Representation (AMBR) program in an HLA federation. The AMBR testbed allows researchers to investigate the types of cognitive functionality required to model individuals participating in command and control teams. Currently in the AMBR testbed a single simulation models both air traffic and the air traffic control console. A point-to-point interface allows different human behavior representation (HBR) simulations (e.g., SOAR, iGEN, ACT-R, D-OMAR) to represent air traffic controller behavior, or allows a human to assume the air traffic controller role.

The "Icarus" Federation, as the resulting experimental air traffic control environment will be known, will lay the foundation for introducing new models for any of the three components. The models that participated in the AMBR project will continue in their existing roles, but the Icarus Federation will use the RTI to connect the air traffic simulation to the air traffic controller simulation. All of the interfaces among the simulations will be made public and captured in the Icarus Federation Object Model (FOM). We anticipate that the HLA constructs will lead to increased flexibility and reuse of the existing models and will open avenues for future explorations of cognitive functionality.

With the new design, several new capabilities are possible:

• *Multiple air traffic controller representations can execute simultaneously*. The HLA will enable multiple homogeneous or heterogeneous representations per execution, so the user might examine the behaviors of air traffic controllers for a region rather than a single sector. The complexities of cooperation between controllers and prioritization of tasks can be examined and may lead to insights into information content required by controllers, or how often information must be updated.

• *Air traffic can be generated by a model that specializes in the representation of air activity*. The current representation provides air traffic for a single air traffic controller sector. By using a model that represents air flight over greater distances for multiple missions or purposes, the representation of activity in the air becomes more realistic or more representative of a particular scenario. This enables the study of air traffic control across multiple air traffic control sectors or across a theater of operations.

• *Fidelity of the representation of the air traffic controller console can be varied*. Separating the console simulation from the air traffic simulation enables the console developer to modify the console representation to meet different requirements. High-fidelity requirements might focus on the presentation of information to the air traffic controller (what type of display causes the controller to notice new information or take action on current information). By contrast, low-fidelity requirements might provide less information to the human behavior representations using a just-in-time construct.

This testbed addresses a critical shortfall within behavior representation: the lack of an environment to evaluate the applicability of the HLA to cognitive model development. The development of this HLA-compliant testbed, in conjunction with service laboratories funding efforts to use the testbed, represents a significant step forward for the cognitive modeling community. Plans are underway to present the results of the first set of Icarus Federation experiments at the 10th Computer Generated Forces and Behavioral Representation Conference in May.

• HLA Help Desk •

Have a question about the HLA? Send your query to the HLA Help Desk at **hla@dmso.mil**. We'll get you an answer.

Paint the Night

Continued from p. 7

metal is bent in order to explore performance (system and battlefield), life cycle and cost issues. This capability will use resources of the DREN, the DoD High Performance Computing Management Office (HPCMO), and other lab facilities to connect RDEC, the Army's Training and Doctrine Command (TRADOC) Battle Lab, and Army Corps of Engineers modeling and simulation capabilities. Plans are underway to extend this effort to Fort Lewis, Wa., Fort Benning, Ga., and Fort Rucker, Ala. in the near future, and could extend to other facilities desiring access to this capability. The NVESD is also discussing the development of an image transport service and a higher bit representation in the RTI to facilitate these goals and demands.

In the meantime, improvements to the PST Federation and the Paint the Night simulation are continuing. Planned improvements include simulation support for Future Combat System sensors, automated target recognition (ATR), microsensors, uncooled IR, passive millimeter wave, 3rd Generation FLIR and other spectral-based sensors. Research is ongoing to employ high resolution computer graphics based on ray-tracing of BRL-CAD models to represent shadows, reflections, 3D atmospheres, smoke and 3D signature prediction for ground, targets and trees.

For more information

For more information contact Max Lorenzo at *max.lorenzo@nvl.army.mil* or (703) 704-3185.

S&T

$19 million for FY00 projects

S&T initiatives program gets fast start on FY00 projects, FY01 plans

By Jim Anthony
DMSO S&T Division

After a quick start in April the DMSO's new Science and Technology (S&T) Division's efforts have already yielded some significant accomplishments.

Following the DMSO's April 19 call for information to identify promising tools and technologies, service and joint modeling and simulation (M&S) offices received over 50 proposals. Thirty-two of the proposals were submitted for evaluation by the S&T Initiatives Task Force (S&TITF), which is comprised of members from the four military services, the joint staff and the DMSO. Of those, 13 projects were selected for funding by the DMSO S&T Division for a total of $2.624 million.

The projects fall in four categories:

- M&S Techniques (five projects)
- Applications (three projects)
- Tools (three projects), and
- Integration (two projects).

Of the 32 proposals, an additional five were selected for funding by other DMSO divisions. Given the S&T Division's goal to coordinate and cooperate with other DoD M&S efforts, the selection of 18 projects is a major accomplishment. The DMSO's $3.496 million of funding was further matched by $15.782 million from the service and joint M&S offices for leverage of over 450%.

The S&T Division has received submissions on over 150 topics from over 50 academic, industry and government organizations in response to the Request for Information on *Advanced Modeling and Simulation Technologies for Supporting Analysis, Acquisition, and Training Simulation Applications* in the June 5 *Commerce Business Daily*.

The information, after evaluation, will furnish valuable guidance for formulating the Fiscal Year 2001 M&S S&T Initiatives Program. The FY01 Program expands the DMSO's reach for innovative projects to meet the needs of the warfighter by soliciting proposals not only from service and joint M&S offices, but also from industry and academia. The DMSO anticipates releasing a call for proposals by the end of September.

For more information

For more information contact Jim Anthony at *janthony@dmso.mil* or (703) 824-3417.

Academy Outreach Program will lay a foundation of M&S knowledge, skills for warfighters, staffs

By Jim Anthony
DMSO S&T Division

Recognizing the need to start laying a foundation of modeling and simulation (M&S) knowledge and skills in the officer corps at the earliest opportunity, the Defense Modeling and Simulation Office (DMSO) has developed an Academy Outreach Program to work with the services and their respective academies to promote M&S education efforts in each school.

In June, the DMSO Science and Technology (S&T) Division hosted a workshop to foster M&S education at the service academies. Representatives included the Air Force, Army, and Navy M&S Offices; the Marine Corps; the Joint Warfighting Center; the Air Force Institute of Technology; the Naval Postgraduate School; the United States Air Force Academy (USAFA); the United States Military Academy (USMA); the United States Naval Academy (USNA); and the M&S Information Analysis Center's (MSIAC) Education Division. Workshop attendees developed an implementation plan, opened new channels of communication and partnership opportunities between DoD M&S organizations and the academies, and created a new forum for promoting DoD M&S education.

Additionally, the DMSO quickly bolstered the academies' M&S education efforts by helping the USAFA to develop a new M&S course using current DoD M&S courses; providing the USMA with a server to support Delta Force Land Warrior training and constructive simulation capabilities and 12 networked computers to supply a virtual warfare simulation capability; and providing the USNA with a Joint Semi-automated Forces (JSAF) capability to support simulation-based experimentation.

Specific Academy Outreach Program objectives for FY01 are to:

- implement an M&S intern program between the DoD service and joint M&S offices and sponsor ten participants from each academy;
- deliver M&S Staff Officer/MS 101, High Level Architecture (HLA), and Synthetic Environment Data Representation and Interchange Specification (SEDRIS) Courses to the academies, and
- assess advanced simulation support for each academy.

FY02 objectives include:

- sponsoring M&S visiting professors at each academy and
- expanding the effort to the services' ROTC programs.

For more information

For more information contact Jim Anthony at *janthony@dmso.mil* or (703) 824-3417.

Concepts Application

M&S Education

MSSOC gets 'doctored' up for DMRTI

By Morris Decker
M&S University

The Modeling and Simulation Staff Officer's Course (MSSOC) got a check up in late July as M&S University instructors delivered the first-ever Medical MSSOC. The course, conducted July 31 through Aug. 2, was hosted by Colonel Johnnie Tillman, Commander, Defense Medical Readiness Training Institute (DMRTI), Fort Sam Houston, San Antonio, Texas.

For the first time, medical warfighters were treated to information relevant to how modeling and simulation (M&S) can increase efficiency and effectiveness in the field of medicine. With instructional topics that included M&S Fundamentals, Human and Organizational Behavior Modeling, Systems Representation and Conceptual Models of the Mission Space, military administrators, doctors, nurses and medical technicians were shown how the world of M&S can provide new training opportunities, tools and techniques.

Operating on the standard MSSOC lessons normally presented to a more general DoD M&S staff officer audience, Paul Murtha of M&S University and a cadre of medical, surgical and M&S experts transplanted medical terminology, methods, examples and photographs throughout the courses. The result of the procedure was an MSSOC with a decidedly medical focus, that can regularly be used for future medical administrator and staff training.

"The development of a modeling and simulation orientation course that has unique medical aspects is a phased process that blends the many facets of the medical arena into an existing MSSOC without, initially, changing the flow of specific lessons or the relationship of one lesson to another," said Murtha. "After the first course at the Fort Sam Houston Defense Medical Technology Research Institute the MSIAC Education Training Team had a better understanding of the medical community's M&S training requirements. Follow-on 'Medical MSSOCs' will have these unique aspects more directly engrained into the general layout of individual lessons."

During the MSSOC, medical personnel learned how Modeling and Simulation can be used for various training and exercise activities, the basics of M&S, advanced M&S concepts, and future technologies and opportunities within the field. Students were familiarized with data standards, how simulations are constructed, High Level Architecture (HLA) requirements for modeling and how the Conceptual Models of the Mission Space (CMMS) is used to provide exact insight into how medical procedures can be documented and modeled. The MSSOC provided the medical warfighters with a solid understanding of M&S topics and how they relate to the field of medicine.

"I now have a firm grasp of the basic concepts of M&S and, more importantly, have a better understanding of where I can go to gain more specialized information and support," Air Force Lt Col Cynthia Scott said. With the help of M&S University, military medical Warfighters now have a larger variety of cures for their modeling and simulation ills.

For more information

For more information concerning this and other Defense Modeling and Simulation Office (DMSO) M&S educational opportunities visit our web site at *http://www.education.dmso.mil/.*

M&S Training

The Defense Modeling and Simulation Office (DMSO) offers a number of modeling and simulation (M&S) education opportunities to promote support for the warfighter. Here is a schedule of courses for the remainder of the calendar year.

Modeling and Simulation Staff Officer Course (MSSOC)

The MSSOC is a week-long course designed for the M&S newcomer and is designed to provide a broad understanding of DoD M&S terms, concepts, organizations and issues.

- MSSOC 00-5, Aug. 8-31 at the Warrior Preparation Center, Germany
- MSSOC 00-6, Sept. 25-29 at the DMSO, Alexandria, Va.
- MSSOC 00-7, Oct. 16-20 at the DMSO, Alexandria, Va.
- MSSOC 00-8, Dec. 11-15 in Orlando, Fla.

For more information and to register online at *http://www.education.dmso.mil/mssoc.asp.*

M&S 101

MS 101 is a four-hour program designed to provide a broad understanding of DoD M&S terms, concepts, organizations, activities, and issues.

- Nov. 27 at the Interservice/Industry Training Systems and Education Conference (I/ITSEC), Orange County Convention Center, Orlando, Fla.
- Dec. 4 at the International Test and Evaluation Association (ITEA), Hilton Hotel, Las Cruces, N.M.

For more DMSO M&S education information visit *http://www.education.dmso.mil/*

HLA Regional Training

These regional training events provide a comprehensive introduction to HLA.

- Sept. 26-27 – * Mid-Atlantic Region at Dahlgren, Va.
- Oct. 17-18 – * Southwest Region at Albuquerque, N.M.
- Nov. 15-16 – Southern Region at Huntsville, Ala.

** A one-day Synthetic Environment Data Representation and Interchange Specification (SEDRIS) course is offered in conjunction with this event.*

For more information about HLA Regional Training and to register online visit *http://www.aegistg.com/Testbase/page1.html*

See M&S TRAINING, p. 5

IEEE

Continued from p. 1

the documents correctly, the Ballot Resolution Committee (BRC) chairs' diligence in entering changes, and our submission of suggested edits to them."

The new HLA standard for modeling and simulation (M&S) consists of three specifications:

- 1516 – Framework and Rules
- 1516.1 – Federate Interface Specification, and
- 1516.2 – Object Model Template (OMT) Specification

"The IEEE standardization is not the end of the process for the DoD," Zimmerman said. "Before the Department can be assured that the 1516 specifications are useful products for the warfighter, a Runtime Infrastructure (RTI) must be built that operates at least as well as the current RTI built to the 1.3 HLA specifications. And it must be verified. In addition, DMSO-produced tools will also be migrated to the 1516 specifications. These additional steps, beyond IEEE standardization, are in keeping with the tradition of the HLA program to build the first prototype of the software and verify its usefulness to the community, and correctness in terms of the specifications.

"This additional work, which began before the IEEE acceptance, is currently underway," she added. "We expect to be completed by the middle of Fiscal Year '01.

"The first IEEE balloting on the three proposed standards was completed about a year ago," she said. "While there were enough votes to close the ballot, there weren't enough positive votes to pass the specifications. This was not unexpected. The process of community balloting opens up a proposed standard to a wider audience. This certainly occurred with the three HLA draft standards. The review by a larger community pointed out both technical and editorial changes to be made.

"For the past year, the ballot resolution committees have worked diligently with the commentors, to come up with the proper wording to correct the discovered errors. In many cases, the decision was easy. In other cases, it took a longer exchange. And, in a few cases, no wording was acceptable," she said. "Once all the acceptable wording was incorporated, the improved documents were resubmitted to the IEEE for the recirculation ballot."

The recirculation ballot group was the same one that had balloted the first submittal. Only those areas of the document that had changed were open to comment. The recirculation ballot closed on July 6 and in the final tally, all three of the proposed standards passed the recirculation with greater than 90 percent approval. This allowed the Simulation Interoperability Standards Committee (SISC) to submit them to the RevCom for approval and subsequent forwarding to the Standards Board.

"The approval of these three specifications is the culmination of nearly three years of effort, in just the IEEE standardization process alone," Zimmerman said. "As the specifications went through the two ballots, over 700 comments were received, scrutinized and incorporated when appropriate. Over 80 people participated in each ballot group, and at least a dozen in the Ballot Resolution Committees. In addition, there were four working group meetings prior to the standard submission. It was a tremendous effort individually, and also a tremendous effort in cooperation among all involved."

One of the DoD's M&S objectives is to establish a common technical framework (CTF) to facilitate the interoperability of all types of models and simulations among themselves and with Command, Control, Communications, Computers and Intelligence (C4I) systems within the Department. The HLA is the cornerstone of that effort. Having it accepted as an international standard is important as well.

As the U.S. and other nations continue to cooperate in multinational coalitions supporting peacekeeping, humanitarian aid, natural disaster relief, and regional security efforts, interoperability is essential for them to work and train together. International simulation standards foster and support interoperability because they provide the capability for nations to build simulations that not only meet their own internal needs, but allow them to operate economically with partner nations as well. Forces can train together for a contingency in a synthetic environment from their home sites at operational, logistics and environmental costs below those inherent in the transport of troops and equipment to a central exercise area somewhere around the globe.

Internationally, the HLA has also been accepted by NATO as the standard for simulations used within the Alliance, and in November 1998 was adopted as an international standard by the Object Management Group (OMG).

MSRRs growing, maturing to best support warfighter

By Gary Misch
MSRR Project Lead

The Department of Defense (DoD) Modeling and Simulation (M&S) Resource Repository (MSRR) program continues to grow and mature.

The program seeks to list all resources of interest to the M&S community within the appropriate sponsor's repository, in order to promote cost reduction and reuse within the DoD. Users of the Defense Modeling and Simulation Office (DMSO) MSRR can currently search the Army, Navy and Air Force systems simultaneously with a search of the DMSO system. Other systems offer similar interoperable features.

The DMSO MSRR node (*http://www.msrr.dmso.mil/*) is now accepting commercial resource listings. Listings are welcome for models, simulations, M&S related tools, databases and other resources of interest to the DoD M&S community. Listings are not limited to resources that have a current, direct application within the DoD. Commercial activities wishing to list their resources should contact Gary Misch at *gl@msiac.dmso.mil* or the MSIAC help desk at *http://www.msiac.dmso.mil/helpdesk/*.

The Army MSRR is undergoing a major renovation to provide more accurate, timely and useful information. To that end, those involved in major Army M&S programs are requested to review the Army MSRR and provide updates as necessary. All updates to the Army MSRR are welcome. Updates should be directly inputted by registration to the Army MSRR.

The Air Force MSRR (*http://afmsrr.afams.af.mil/*) continues to provide searchable resources to an ever-expanding Air Force and DoD customer base. Resources have increased by over 50 percent in the past year, and continue to grow at the same pace. Several new resource categories have been added in the past six months, including facilities, authoritative data sources, technology research and studies. Categories planned for the next six months include wargaming, lessons learned and events (for future calendaring efforts). The Air Force Agency for M&S (AFAMS) has created a help desk for Air Force M&S issues. Contact the help desk at DSN 970-5959 or online at *M&S_Info@afams.af.mil*.

The MSRR program is a cooperative effort between the DMSO; the Army; the Navy; the Air Force; the Defense Intelligence Agency (DIA); the Ballistic Missile Defense Organization (BMDO); the Assistant Secretary of Defense for Command, Control, Communication and Intelligence (ASD[C3I]) Command, Control, Communication, Computers, Intelligence, Surveillance and Reconnaissance (C4ISR) Decision Support Center; and the M&S Information Analysis Center (MSIAC).

For more informamtion

For a complete listing and addresses for all systems participating in the MSRR system, visit *http://www.msrr.dmso.mil/SiteMapContent.htm*.